## REMARKS

Claims 165-326, 328-330, 333-335, 338-340, 343-345, 348-350, 353-355, 358-360, 363-365, and 368-370 are pending in the instant application. Claims 171-182, 225-236, 279-290, 328-330, 333-335, 338-340, 343-345, 348-350, 353-355, 358-360, 363-365, and 368-370 are withdrawn. Claims 327, 331-332, 336-337, 341-342, 346-347, 351-352, 356-357, 361-362, 366-367, and 371 are cancelled. Several of the claims, including independent claims 165 and 209 stand rejected under 35 USC § 101 as being directed to non-patentable subject matter. Several of the claims, including independent claims 165, 209, 219, 263, 273, and 317, stand rejected under 35 USC § 112, second paragraph, as being indefinite. Independent claims 165, 209, 219, 263, 273, and 317, as well some dependent claims, stand rejected under 35 USC § 103(a) as being unpatentable over the combination of Sandretto in view of Pang. Most of the remaining claims stand rejected over combinations of Sandretto, Pang, Erlach, Huneault, Lipton, and Sant. Applicants note that while claims 204, 206, 215-218, 258, 260, 269-272, 312, 314, and 323-326 stand rejected under 35 USC § 101, they do not stand rejected under 35 USC §§ 102 or 103.

Applicant has already amended the independent claims to further define the claimed subject matter, so as to advance prosecution of the application towards allowance. In the following remarks, Applicant addresses the outstanding Response to Arguments, Claim Objections and Claim Rejections raised in the Official Action and further explains that the subject matter of applicant's claims is patentable in view of the references of record. Should the examiner have questions or concerns, or if it would otherwise be helpful to advancing prosecution of the present application, the examiner is invited to call Applicant's undersigned attorney at (206) 332-1380.

### *Response to Arguments*

In the Official Action, at 3, the Office states:

"Respectfully, the claims cannot be abstract."

Applicant discusses this point under the under the heading 35 USC § 101 below.

In the Official Action, at 4, the Office states:

> "Respectfully, claims are interpreted in light of the specification, but limitations are not read into the claims. Computers performing steps must be recited in the claim."

Applicant respectfully submits that all of the Applicant's claims involve the use of a computer for at least the reasons discussed below.

In the Official Action, at 5, the Office states:

> "Respectfully, it is unclear what physical transformation is happening in the claims. Price of an asset, for example, is a concept (e.g. a price is not physical but an abstract concept). Transformation or reduction of prices based on a formula is not a physical transformation."

The claims do recite a physical transformation, inasmuch as when a representation of a solution is stored in a computer memory, that computer memory is physically transformed. MPEP 2106.01 supports this rationale: "When functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized." While that excerpt of the MPEP is directed to a computer-readable medium claim, the underlying logic is applicable to all types of claims: by recording or storing data in a computer-readable medium such as a computer memory, that computer-readable medium is transformed by becoming structurally and functionally interrelated with the data, and thus is statutory subject matter.

In the Official Action, at 6, the Office states:

"A new 35 USC 101 rejection is provided. Claims cannot be abstract."

Applicant discusses this point under the under the heading 35 USC § 101 below.

In the Official Action, at 8, the Office states:

> "Respectfully, it remains indefinite as to determining a risk premium incorporated into the rate of return. The risk premium could be arbitrarily decided by someone or based on the difference between a risk-free return or something else. This rejection is modified but maintained."

Applicant has amended the claims in question, as discussed below, and submits that this overcomes the modified rejection.

In the Official Action, at 8, the Office states:

> "With all due respect, designating is indefinite. Further, this step basically designates a solution to a problem (how does someone do this?). It is further indefinite as to how this step relates to the prior step of determining and the subsequent step of defining. A modified rejection is provided to further elaborate on why this is indefinite."

Applicant has amended the claims in question, as discussed below, and submits that this overcomes the modified rejection.

In the Official Action, at 10, the Office states:

> "This remains indefinite. Defining a financial model representing a relationship between risk premiums could be anything."

Applicant has amended independent claims 165, 219 and 273 to clarify that the relationships are those set out in the preceding steps of the respective claims.

In the Official Action, at 10, the Office states:

> "Respectfully, the steps of these claims remain indefinite. Steps need to claim the invention."

Applicant has amended claims 165, 219 and 273 as per above. Claims 209 and 317 had already been amended to clarify the steps involved, but Applicant has made a further amendment to clarify that values for risk parameters in the first step are specified by a user.

In the Official Action, at 13, the Office states:

> "A new rejection is provided based on the amendment. Respectfully, there is not one known sum of the products."

Applicant has amended claims 169, 223 and 277.

In the Official Action, at 16, the Office states:

"Respectfully, the term "the returns of the firm" lacks antecedence.'

Applicant has amended the claims in question, as discussed below, and submits that this overcomes the modified rejection.

In the Official Action, at 27, the Office states:

> "In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., "single underlying asset") are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181,26 USPQ2d 1057 (Fed. Cir. 1993)."

Applicant respectfully submits that independent claims 165, 219 and 273 explicitly recite "an underlying asset" as part of the claimed invention. For example, claim 165 reads "A computer implemented method for relating a price or value of a plurality of securities associated with an underlying asset…" By definition "an underlying asset" is singular. The "single underling asset" (which may be a single firm) concept of the Applicant's invention is discussed in the instant specification, for example at [0001], [0014] and [0037]. Furthermore, this key concept would be evident to one with skill in the art from reading the instant specification and the illustrative embodiments contained therein.

In the Official Action, at 27, the Office states:

> "With all due respect, applicant's invention teaches expected returns are measured over time.
>
> > "In particular, in the case of the price of the risk of volatility of expected returns, measured over discrete time, the price of risk (i.e. the volatility

> risk premium) is the same for all firm (or asset) specific securities." [0014] (Pub. No. US 2009/0106133)
>
> In the same sense, Sandretto teaches volatility measured over time. Beta as taught by Sandretto is determined by returns on asset."

Applicant respectfully notes that the phrase "measured over discrete time" in the instant specification [0014] refers to "volatility of returns", not "returns." This key manner in which volatility is specified in embodiments of the invention is made clear in the instant Specification by contrasting it with an alternative measure of volatility used in the art, that of "instantaneous volatility", refer [0009]. It is also evident from the instant specification at [0035], [0108], [0110], [0111] and [0170]. Notwithstanding this, the Applicant notes that independent claims 165, 219 and 273 have already been amended to make it clear that the "discrete time" measure is of volatility, rather than returns.

Embodiments of the invention teach that a priced risk factor is the volatility (of expected returns) measured over discrete time. Sandretto does not teach that volatility is a priced risk factor, and Sandretto teaches that beta is a priced risk factor. Beta and volatility are different concepts. Moreover, Sandretto does not teach that volatility should be measured over discrete time, for use as a priced risk factor.

In the Official Action, at 28, the Office states:

"From above...

> »Pang et al. do not teach use of risk premia, either on a market-wide or asset-specific basis.«
>
> Sandretto teaches risk premia and beta. Pang et al. was simply used to literally teach volatility.
>
> Claim 165 reads on a CAPM. Applicant is arguing that because they are applying a CAPM to an individual firm, their claim is novel. With all due respect to the Applicant, their invention is about using a CAPM model for an individual firm, Claim 165 does not recite those limitations that distinguish it from a CAPM."

Applicant respectively submits that the invention recited in claim 165 is fundamentally different from the CAPM and that there is therefore no need to distinguish it from the CAPM by

way of further limitations to the claims. The CAPM prices risk on a market-wide basis, a single market risk premium is applied to all risky assets. For an individual security this market risk premium is then "scaled" by the "beta" for that security. Beta is not a measure of a security's volatility, but rather of the security's covariance with the overall market, divided by the variance of the market. The CAPM is routinely applied to individual firms, but by using a market-wide risk premium and a market-wide related risk measure for each individual firm (beta). In contrast to this embodiments of the invention price risk on an individual (underlying) asset basis – there is a separate risk premium for each underlying asset. For an individual security related to an underlying asset, this asset-specific risk premium is multiplied by the volatility, measured over discrete time, of that security.

The body of knowledge in the art around the CAPM teaches away from the volatility of an individual security being a relevant, priced risk factor. Under the CAPM only the market-wide linked proportion of an individual security's volatility is relevant, via the beta measure.

In the Official Action, at 28, the Office states:

> "Respectfully, any option-theoretic model reads on claim 209. Claim 209 is very broad and abstract."

Applicant respectively submits that the invention recited in claim 209 provides a specific, novel and useful way to fit an option theoretic model of the firm – by using risk parameters measured over discrete time. Applicants submit that neither broadness nor abstractness is the standard for examination under 35 USC §§ 102 or 103. The Office does cite to Sandretto in formulating a rejection under 35 USC § 103, but for reasons discussed below, Sandretto does not teach the claimed discrete time risk measure or an option theoretic model of the firm.

In the Official Action, at 29, the Office states:

> "Respectfully, It is unclear what claims are being addressed above. Applicant is arguing the prior art does not apply to their invention. Applicant is reminded that while claims interpreted in light of the specification, limitations are not into the claims. The claims need to provide the above limitations. Specific claims should be cited with the limitation in the claim that reads over the prior art."

Applicant respectively submits that the arguments previously presented were to show that the prior art cited by the Office is of very limited relevance to embodiments of the invention. Accordingly, it is simply not relevant to attempt to draft the claims by way of limitations as against this particular prior art. Notwithstanding this, the Applicant's claims do provide specific limitations against the prior art in general, specifically (by reference to claim 165, by way of illustration):

- the price or value of a plurality of securities is associated with a single underlying asset;
- a risk premium is incorporated in the rate of return for each security;
- a priced risk factor incorporated in the risk premium for each security is volatility, measured over discrete time; and
- the price per unit of this risk factor is the same for two or more of the securities associated with an underlying asset.

The Office has not established that these key elements of the claimed invention are present in the prior art cited. Applicant also references the arguments raised to specific claims, in the below remarks.

In the Official Action, at 31, the Office states:

"Respectfully, arguments need to be specific and directly related to specific, cited claims."

The Applicant has both discussed embodiments of the invention in general that illustrate the claimed invention in the hopes of making clear the Applicant's understanding, as well as discussed the references as they apply to specific claims, as the Applicant has done below.

Official Action, at 32. the Office states:

"Specific claims that include the above features need to be cited."

The Applicant references the arguments raised to specific claims, as discussed below.

In the Official Action, at 32, the Office states:

> "Respectfully, the claims are so broad just about any art that teaches a CAPM reads on the claims. Sandretto alone teaches beta, which is volatility. Pang et al. was simply used to teach the word volatility, which was probably not required. The claims need to recite the features to distinguish the claims from the prior art."

As discussed above, the CAPM is a fundamentally different model that does not read on the invention recited in the claims.

In the Official Action, at 32, the Office states:

> "Respectfully, the amended claims require creating an option-theoretic model, which could be anything. Applicant's invention is not directed at creating models."

Applicant respectfully submits that an option-theoretic model is a particular type of financial model known in the art. The instant specification makes it clear what is meant by an option-theoretic model as it is explicitly recited in some claims. For instance, at [0004] the option-theoretic model is attributed to Merton, as known in the art. At [0147] an illustration of an option theoretic model is provided. At [0205]-[0211] variations of the option-theoretic model known in the prior art are cited.

### *Claim Objections*

The Office states that claims 209, 263 and 317 need to be indented. Official Action, at 34. The Applicant has amended these claims with indentations, and requests that the Office reconsider the objections.

### *Claim Rejections – 35 USC § 101*

**Claims 165-170 and 183-218 stand rejected under 35 USC § 101 because the Office states that the claimed invention is directed to non-statutory subject matter.** Official Action, at 34. Specifically, the Office states

> In the case of claims 165 and 209 of the instant application, step (d) of claim 165
>
> and step (i) of claim 209 are treated as insignificant in 101 analysis since these steps are storing a result even if such process is carried out via a machine. On the

> other hand steps (a)-(e) of claim 165 and steps (a)-(i) of claim 209 may be performed by a human mind yielding subjective and unpredictable result and therefore directed to an abstract idea.

Official Action, at 36. The Applicant have amended various recitations of claims 165 and 209 to recite that that they are performed "by a computer." The Applicant submit that these amendments overcome the present rejections.

Claims 166-170, 183-208, and 218 stand rejected under 35 USC § 101 because the Office states that they depend from either claim 165 or 209, yet do not cure the deficiencies of their parent claim. Official Action, at 36. The Applicant submits that the present amendments to claims 165 and 209 overcomes the rejections of claims 166-170, 183-208, and 218.

Additionally, the Applicant submits that the recitation of the claims being "computer implemented" is sufficient to make the claims considered statutory subject matter under 35 USC § 101. MPEP 2106 sets forth requirements for examining a claim under 35 USC § 101, and this portion of the MPEP requires that the Office must consider a claim as a whole when evaluating it under 35 USC § 101:

> Finally, when evaluating the scope of a claim, every limitation in the claim must be considered. USPTO personnel may not dissect a claimed invention into discrete elements and then evaluate the elements in isolation. Instead, the claim as a whole must be considered. See, e.g., Diamond v. Diehr, 450 U.S. 175, 188-89, 209 USPQ 1, 9 (1981) ("***In determining the eligibility of respondents' claimed process for patent protection under § 101, their claims must be considered as a whole.*** It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. This is particularly true in a process claim because a new combination of steps in a process may be patentable even though all the constituents of the combination were well known and in common use before the combination was made.").

(Emphasis added). In view of this requirement to consider the claim as a whole, the Applicant submits that a "computer implemented" claim is necessarily statutory subject matter. In view of these claim amendments and remarks, the Applicant requests that the Office reconsider these rejections.

In addition, the Applicant submits that the ability of embodiments of the invention to allow analysis of a wide range of securities within a single, unified and coherent framework leads to a reduction in the physical computing resources required to analyze these securities. Refer instant specification [0001-0004, 0012-0013, 0027, and 0203]. As described in the specification separate financial models and databases are typically used by practitioners to evaluate the option securities, [FIG. 1], the debt securities [FIG. 2] and the equity securities [FIG. 3] of a firm. Embodiments of the Applicant's invention enable all of these securities to be evaluated within only one model and with less databases, as illustrated at [FIG. 4], which illustration shows a reduction in the data input and modelling requirements by comparison to the collective resources required for [FIG.1], [FIG 2.] and [FIG. 3]. Embodiments of the Applicant's invention thus leads to real and tangible savings in the physical computing resources required to analyze such a range of security types.

***Claim Rejections – 35 USC § 112***

**Claims 165-170, 183-224, 237-278 and 291-326 stand rejected as being rejected under 35 USC § 112, second paragraph, because the Office states that they are indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention**. Official Action, at 36.

The Office states, "Claim 165, step 1 has "determining a risk premium incorporated in the rate of return ... " where it is indefinite as to how determining a risk premium in a rate of return is accomplished. How do you determine a risk premium in a rate of return? Claims 219 and 273 have the same problem." Official Action, at 36. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 165, step 2 has "designating that a price risk factor incorporated in the risk premium ... is the volatility of returns" where it is indefinite as to how a price risk factor is designated. Designating is the same as defining, and this step tries to define a solution (risk factor is the same for two or more securities). It is indefinite as to how this is done. It is also indefinite as to how this step of designating relates to the prior step of determining a risk premium and the later step of defining a financial model. Claims 219 and 273 have the same

problem." Official Action, at 37. Applicant respectfully submits that this step does not define a solution, but rather is defining or specifying a constraint or rule to be included in the financial model.

The Office states, "Claim 165, step 3 has "defining a financial model representing at least one relationship between the risk premiums... " where it is indefinite as what financial model is (what is the scope of a financial model), how the model represents a relationship, and what a relationship between the risk premiums involves. Claims 219 and 273 have the same problem." Official Action, at 37. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 165, step 3 has "risk premiums determined for each security" where there is no antecedence for risk premiums (plural). Claims 219 and 273 have the same problem." Official Action, at 37. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 165, step 4 has "storing the financial model" where it is indefinite as to how a model is stored. This is interpreted to mean some type of equation that represents a model stored in memory. This step simply stores an equation. Claim 219 has the same problem." Official Action, at 37. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 169 recites the limitation "the product of the risk exposures" in the calculating a price per unit step. There is insufficient antecedent basis for this limitation in the claim. Claims 223 and 277 have the same problem." Official Action, at 38. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 206 recites the limitation "the returns on the firm ... " There is insufficient antecedent basis for this limitation in the claim. Claim 314 has the same problem." Official Action, at 38. Applicant has amended these claims to overcome the rejections. Applicant has also amended claims 204-205, 207, 258-261, 312-313, and 315 to address the same issue.

The Office states, "Claim 209 and 317 have "specifying values for risk parameters" where it is indefinite as to how the values are specified (e.g. arbitrarily by a person). Further it is indefinite as to why multiple values are specified for multiple risk factors. One risk parameter

could have multiple values for example. Claim 263 has a similar problem of receiving specified values." Official Action, at 38. Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 has "determining a plurality of input parameters" where it is indefinite as to how determining input parameters is accomplished and what the input factors are. A person could determine in their mind what an input parameters is, and it could be anything, not even a number. Claim 263 has a similar problem of receiving input parameters, which could be anything." Official Action, at 38. Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 have "defining relationships between said input parameters" which is indefinite as anything could be defined as a relationship (e.g. the parameters are integers)." Official Action, at 38. Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 have "creating a computer implemented option-theoretic model of the firm" which is indefinite since creating is the same as generating and it is indefinite as to how a model is generated or created. Further, it is indefinite as to what the model involves. There are no limitations as to what the model is so just about any model would could be created and called an option-theoretic model." Official Action, at 38. Applicant has amended these claims to overcome the rejections. Moreover, the Applicant respectfully submits that the general scope of an option-theoretic model is known in the art and is described in the instant specification, as noted above.

The Office states, "Claims 209 and 317 have "inputting the input parameters to the model" where it is indefinite as to how input parameters are input into the model. Is the model an equation with variables, and numbers are input into the equation?" Official Action, at 39. Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 have "estimating one or more risk parameters form the model" where it is indefinite as to how estimating is accomplished by the model." Official Action, at 39. Applicant respectively notes that these claims read "from the model", not "form the model". Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 have "solving the model" where it is indefinite as to how the model is solved. Claim 263 has a similar problem." Official Action, at 39. Applicant has amended these claims to overcome the rejections.

The Office states, "Claims 209 and 317 have "storing the solution" where there is no antecedence for "the solution."" Official Action, at 39. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 263 has "when the system is operational" which is indefinite as to when this happens. This is ignored." Official Action, at 39. Applicant has amended these claims to overcome the rejection.

The Office states, "Claim 263 has "when executed on a processor" where antecedence is provided for a processor. This should be "when executed by the processor."" Official Action, at 39. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 263 has "estimating one or more risk parameters ...from said option-theoretic model. .." where it is indefinite as to how the model estimates." Official Action, at 39. Applicant has amended these claims to overcome the rejections.

The Office states, "Claim 263 has "defining an option-theoretic model of a firm" where defining a model is indefinite since any model could be defined as an option-theoretic model." Official Action, at 39. Applicant has amended these claims to overcome the rejections. Moreover, the Applicant respectfully submits that the general scope of an option-theoretic model is known in the art and is described in the instant Specification, as noted above.

The Office states, "Dependent claims 166-170, 183-208,210-218,220-224,237-262,264-272,274-278, 291-316, and 318-326 are rejected because they depend from their respective independent claim." Official Action, at 39. Applicant submits that present amendments and remarks regarding the respective parent claims overcomes the present rejections under 35 USC § 112, second paragraph, and requests that the Office reconsider these rejections.

### *Claim Rejections – 35 USC § 103*

The invention described in Applicant's independent claims stand rejected as being unpatentable over the combination of Sandretto and Pang et al. In addition, some of the claims

stand rejected over the combination of Sandretto in view of Pang in further view of Erlach et al, Hunealt, Lipton et al, or Sant.

In the following remarks Applicant focuses attention on the rejections based on the combination of Sandretto in view of Pang. As Applicant shows below, (1) this combination fails to teach certain important aspects of Applicant's claimed subject matter, (2) is also unsupported as lacking a rational explanation of why the combination would have been obvious, and (3) is improper for purposes of finding Applicant's independent claims unpatentable. As Applicant also shows below, the prior art teaches away from Applicant's subject matter and Applicant's subject matter produces unexpected results.

Claims 208, 262, and 316 stand rejected, in part, because the Office states that they recite limitations that carry no patentable weight as being non-functional descriptive material. Official Action, at 58. Applicant respectively submits that these claims have already been amended to address this issue, which was also raised in the previous Office Action dated 17 June 2010. If the Office has maintained this assertion of "no patentable weight" in the present Office Action despite these claim amendments, applicants request that the Office clarify that this is the case.

## I. The Claimed Invention

Applicant's Disclosed Subject Matter

As discussed in paragraph [0014] of the instant specification, the broad concept of embodiments of the invention is that two or more securities issued by, or referenced to, a firm (or other asset) share exposure to the same underlying sources of risk and the price of these priced risk factors can be analysed at the firm (or asset) specific level. In particular, in the case of the price of the risk of volatility, measured over discrete time, of expected returns the price of risk (i.e. the volatility risk premium) is the same for all firm (or asset) specific securities. Moreover, in the case of debt-type securities the promised yield spread is analysed as comprising at least an expected default loss component and an expected risk premium (or premia) component.

As discussed in paragraph [0083] of the instant specification, embodiments of the invention differ from other models known in the art, such as the Capital Asset Pricing Model and

the Arbitrage Pricing Theory, which latter models include a market-wide price of risk. The latter models are not based on underlying asset specific measures of total risk, but rather are implemented by only pricing the systematic or market correlated element of risk or risks.

As discussed in paragraph [0114], and illustrated in figure 8, of the instant specification, despite the Black-Scholes option pricing model being based on the premise of a single volatility input, the volatilities implied by market option prices and inverting the Black-Scholes model differ across different strike prices - the so called "volatility smile" problem. As discussed in paragraph [0115] of the instant specification, a preferred embodiment of the invention provides a much closer fit to observed market prices across all exercise prices.

Applicant's Claims

The instant application includes two general groups of claims, each with three independent claims. One general group includes independent claims 165, 219, and 273, while the other general group includes independent claims 209, 263, and 317.

In the first group of claims, claim 165 is directed to a computer implemented method, claim 219 is directed to a system, and claim 273 is directed to a computer readable medium. Each of the independent claims in this group recites that a risk premium is incorporated in the rate of return for each security, that the price per unit of a priced risk factor is the same for two or more securities associated with an underlying asset and that a priced risk factor is the volatility, measured over discrete time, of returns. For example, claim 165, as currently amended, reads as follows (emphasis supplied):

> 165. A computer implemented method for relating a price or value of ***a plurality of securities associated with an underlying asset***, the rate of return on said securities and the risk attributes of said securities, the method comprising the steps of:
>
> determining ***a risk premium, above a risk free rate of return, incorporated in the rate of return for each security***;
>
> designating that ***a priced risk factor incorporated in the risk premium for each security is volatility, measured over discrete time, and that the price per unit of this risk factor is the same for two or more of the said securities***; and

> defining a financial model that represents the above relationships for the risk premium determined for each security; and
>
> storing the financial model in a computer memory.

Claims 219 and 273 include similar recitations.

In the second group of claims, claim 209 is directed to a computer implemented method, claim 263 is directed to a system, and claim 317 is directed to a computer readable medium. Each of the independent claims in this group recites an option-theoretic model of a firm, generating risk parameters from the model, estimated over a discrete time period, and solving the model so that the value of these parameters equal user specified values. For example, claim 209, as currently amended, reads as follows (emphasis supplied):

> 209. A computer implemented method for applying an option-theoretic model of a firm comprising the steps of:
>
> ***receiving a value for one or more risk parameters, as specified by a user***;
>
> defining a plurality of input parameters to the option-theoretic model;
>
> defining mathematical relationships between said input parameters;
>
> ***creating a computer implemented option-theoretic model of the firm***, based on these input parameters and mathematical relationships
>
> receiving a value for each input parameter, as specified by the user;
>
> inputting the values for the input parameters to the model;
>
> ***running the model to produce an estimated value for one or more of the risk parameters, measured over a discrete time period***;
>
> ***solving the model to provide a solution, the solution comprising an estimate for the value of each of the input parameters that the user allows to vary from the received values, such that the estimated risk parameters from the model equal the values specified by the user***; and
>
> storing the solution to the model in a computer memory.

Claims 263 and 317 include similar recitations.

## II. The Prior Art Cited in the Office Action

Claims 165-168, 185, 187-189, 191, 195-197, 199, 202-203, 209-214, 219-222, 239, 241-243, 245, 249-251, 253, 256-257, 263-268, 273-276, 293, 295-297, 299, 303-305, 307, 310-311, 317-322 stand rejected as being unpatentable over the combination of Sandretto in view of Pang et al. Official Action, at 40.

In addition, claims 169-170, 223-224, and 277-278 stand rejected over Sandretto in view of Pang in further in view of Erlach et al. Official Action, at 49.

In addition, claims 183-184, 237-238, and 291-292 stand rejected over Sandretto in view of Pang and further in view of Hunealt. Official Action, at 53.

In addition, claims 186, 205, 207-208, 240, 259, 261-262, 294, 313, and 315-316 stand rejected over Sandretto in view of Pang and further in view of Lipton et al. Official Action, at 55.

In addition, claims 190, 192, 244, 246, 298, and 300 stand rejected over Sandretto in view of Pang and further in view of Sant. Official Action, at 58.

In addition, claims 193-194, 247-248, and 301-302 stand rejected over Sandretto in view of Pang and further in view of Lipton et al. Official Action, at 60.

In addition, claims 198, 252, and 306 stand rejected over Sandretto in view of Pang and further in view of Sant. Official Action, at 60.

In addition, claims 200, 254, and 308 stand rejected over Sandretto in view of Pang and further in view of Sant. Official Action, at 62.

In addition, claims 201, 255, and 309 stand rejected over Sandretto in view of Pang and further in view of Lipton et al. Official Action, at 63.

Sandretto discloses the capital asset pricing model (CAPM). Under this model the risk measure is "beta," which is multiplied by a market-wide risk premium and added to a risk free rate in order to arrive at an expected rate of return for an asset. Sandretto discloses that different risk premia can be used for different asset classes, such as US stocks or UK Treasury securities. Sandretto discloses a "default risk premium" for debt. Sandretto discloses correlation between variables, as an input.

Pang discloses a volatility calculator in an apparatus and method for pricing financial derivatives.

Erlach et al. disclose that a junk bond yield includes a default rate premium and that a required stock yield must incorporate a greater default risk premium.

Hunealt discloses topographical mapping of insurance in relation to options.

Lipton et al. disclose analysis of default in accordance with Zhou's model.

Sant discloses calculation of portfolio risk and return measures, one of which is the covariance of a pair of stocks in a portfolio.

## III. The Rejection Under Section 103(a) is Improper

Applicant will now explain why the rejections under Section 103(a) should be withdrawn. As discussed below, Applicant respectfully requests that the Office consider four high-level reasons for overturning the rejections: (1) There are substantial differences between Applicant's claimed invention and the cited combination of Sandretto in view of Pang; (2) the prior art teaches away from Applicant's claimed invention; (3) Applicant's claimed invention yields unexpected results; and (4) the rationale advanced by the Office for rejecting the claims based on the combined teachings of Sandretto and Pang et al. is conclusory and legally deficient. Applicant respectfully requests that the Office reconsider the rejections.

Differences Between the Claimed Invention and the Prior Art

Regarding the combination of Sandretto in view of Pang et al. (Official Action at 40), the Office states that "Beta is the volatility of the return," and also that "Sandretto teaches beta, he does not teach "volatility." Applicant respectfully disagrees with the first statement. Beta is *not* the volatility of returns, and Sandretto does not teach this. Sandretto, rather, teaches beta in the CAPM context, as known in the art.

Sandretto teaches use of a market-wide risk premium, or a risk premium *for asset classes* (such as US stocks or corporate stocks). Applicant's invention teaches use of risk premia (or the price per unit of a risk factor) that are *specific to "an underlying asset"* and the securities

associated with that asset. This limitation is expressed in the Applicant's claims, refer for example claim 165 "…an underlying asset…" Independent claims 219 and 273 use similar wording. By way of dependency this limitation is also present in Applicant's claims 166-170, 183-208, 220-224, 237-262, 274-278, and 291-316.

Sandretto teaches the use of *beta*, not volatility, as the priced risk measure. Applicant's invention teaches the use of *volatility*, measured over discrete time, as a risk measure. This limitation is expressed in the Applicant's claims, refer for example claim 165 "…a priced risk factor incorporated in the risk premium for each security is volatility, measured over discrete time…". Independent claims 219 and 273 use similar wording. By way of dependency this limitation is also present in Applicant's claims 166-170, 183-208, 220-224, 237-262, 274-278, and 291-316.

Pang et al. teaches the use of an implied volatility calculator. Pang et al. states, "The basic framework of the forward pricing program is that of Black and Scholes…" Pang, at col. 5, lines 53-54. The Black-Scholes framework is that of a risk neutral world, that is there is no risk premium included in the Black-Scholes option pricing model. Pang et al. present several formula in the specification and in the claims where the rate of return used to calculate implied volatility is "*r*," which they define as the risk-free interest rate. Pang et al. do not teach use of *risk premia*, either on a market-wide or asset-specific basis. Embodiments of Applicant's invention teaches the use of risk premia. This limitation is expressed in the Applicant's claims, refer for example claim 165 "…determining a risk premium, above a risk free rate of return, incorporated in the rate of return for each security…". Independent claims 219 and 273 use similar wording. By way of dependency this limitation is also present in Applicant's claims 166-170, 183-208, 220-224, 237-262, 274-278, and 291-316.

Neither Sandretto nor Pang et al. teach the use of an option-theoretic model of the firm. This limitation is present, either expressly or by way of dependency, in Applicant's claims 185-203, 205, 207-218, 239-257, 259, 261-272, 293-311, 313, 315-326.

Where Sandretto teaches a "default premium" for debt issues or bond, no distinction is made between an expected default loss and a risk premium for such debt issues. In Applicant's specification and claims, this is an important distinction that is made in analysing all debt issues

or bonds. Refer, for example, to the instant specification at [0037], and [0039], and claim 166. This limitation is present, either expressly or by way of dependency, in Applicant's claims 166, 169-170, 220, 223-224, 274, and 277-278.

Sandretto teaches the use of means, correlations and statistical distributions of economic variables as *inputs* to a system. By contrast, embodiments of Applicant's invention use means and correlations to *solve or fit* models. This limitation is present, either expressly or by way of dependency, in Applicant's claims 188-192, 196-200, 210-218, 242-246, 250-254, 264-272, 296-300, 304-308, and 318-326. Furthermore, embodiments of Applicant's invention can be practised using *higher statistical moments*, such as skewness and kurtosis, to *solve or fit* models. This feature is present in Applicant's claims 183-184, 186, 204-207, 210, 237-238, 240, 258-261, 264, 291-292, 294, 312-315, and 318. This feature is also discussed in the instant specification, for example at [0014], [0035], [0077], [0081]-[0082], [0088], [0116]-[0118], [0127], [0131]-[0132], [0140], [0193], and [0199].

Regarding the combination of Sandretto in view of Pang in further in view of Erlach et al., Official Action at 49. The limitations of the Applicant's claims over Sandretto with regard to the Applicant's invention relating risk premium to a single underlying asset, rather than use of a market risk premium, and the use of volatility measured over discrete time, rather than beta have been discussed above. Erlach et al. teaches incorporation of a default risk premium in a required stock yield (Erlach et al., at [0109]). Applicant's claimed invention does *not* incorporate a default risk premium in a required stock yield. Applicant's claimed invention makes a distinction between an expected default loss and a risk premium when used to analyse debt-type securities. This limitation is present, either expressly or by way of dependency, in Applicant's claims 166, 169-170, 220, 223-224, 274, and 277-278. Additionally this is discussed at the instant specification, for example, at [0014].

Erlach et al. teach that *at-risk bonds cannot yield more than treasuries* in real, after-tax terms in the aggregate, and *after defaults* net of recoveries and related costs (Erlach et al., at [0137]). Embodiments of Applicant's invention teach that *risky debt-type securities earn a risk premium above a risk free rate* (such as treasuries), after allowing for expected default losses. This limitation is expressed in the Applicant's claims, refer for example claim 165

"…determining a risk premium, above a risk free rate of return, incorporated in the rate of return for each security…". Independent claims 219 and 273 use similar wording. By way of dependency this limitation is also present in Applicant's claims 166-170, 183-208, 220-224, 237-262, 274-278, and 291-316. Additionally, refer, for example, to the instant specification at [0037], and [0039].

Regarding the combination of Sandretto in view of Pang in further in view of Hunealt, Official Action, at 53, the limitations of the Applicant's claims over Sandretto with regard to the Applicant's invention use of volatility measured over discrete time, rather than beta have been discussed above. Hunealt teaches a method for the topographical mapping of investment risk. This mapping method is unrelated to Applicant's invention. Hunealt applies a topographical mapping method to options, but in doing so merely uses the Black-Scholes risk neutral option valuation framework that is known in the art (Hunealt, at [0188]-[0189]) and referred to in Applicant's specification. Refer, for example, to the instant specification at [0003]. The Black-Scholes framework is that of a risk neutral world, that is there is no risk premium included in the Black-Scholes option pricing model. Embodiments of Applicant's invention teach the use of risk premia in pricing or valuing options. This limitation is expressed in the Applicant's claims, refer for example claim 165 "…determining a risk premium, above a risk free rate of return, incorporated in the rate of return for each security…". Independent claims 219 and 273 use similar wording. By way of dependency this limitation is then also present in Applicant's claims 183-184, 237-238, and 291-292, which are claims that the Office cites to Hunealt in regards to.

Regarding the combination of Sandretto in view of Pang in further in view of Lipton et al., Official Action at 55, Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Lipton et al. uses a risk free interest rate (r) in its application, where it is variously referred to as "the risk free interest rate" (Lipton, at [0011]), "the risk neutral rate" (Lipton, at [0045] and [0065], and claims 1, 6, 11, 12, 22, and 32), and "the interest rate" (Lipton at [0103], [0113], and [0121], and claims 17, 18, 19, 26, 27, and 29). Lipton et al. does not teach use of risk premia, of volatility as a priced risk factor, or of expected loss given default. Embodiments of the Applicant's invention do not use the "risk neutral world' framework, instead it uses a "real world" framework. This limitation is expressed

in the Applicant's claims, refer for example claim 186: "…specifying the real world distribution process that the returns on the firm's assets are expected to follow…" and "…discounting back to present value (as at the chosen evaluation date) the expected pay offs of each security being analysed using a risk adjusted discount rate…". Claims 240 and 294 use similar wording. By way of dependency this limitation is then also present in Applicant's claims 205, 207-208, 259, 261-262, 313, and 315-316, which are claims that the Office cites to Lipton in regards to (in the Official Action, at 55). This point is also discussed at the instant specification at [0004], [0007]-[0008], [0072], [0122], and [0205].

Regarding the combination of Sandretto in view of Pang in further in view of Sant, Official Action at 58, Sant teaches analysis of the covariance between pairs of stocks as an intermediate step to calculating the variance of a portfolio (Sant, at [0444]). Embodiments of Applicant's invention are not directed to portfolio risk analysis and does not analyse the covariance between pairs of stocks. Rather, embodiments of Applicant's invention use covariance in order to fit models. For this purpose, embodiments of the Applicant's invention analyse the covariance between a security and the underlying firm to which it is referenced (this limitation is present in Applicant's claims 192, 246, and 300), or between pairs of securities referenced to the same firm (of which only one type of security can be common stock, as is known in the art) (this limitation is present in Applicant's claims 190, 244, and 298).

Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 60, Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Lipton et al. uses a risk free interest rate (r) in its application, where it is variously referred to as "the risk free interest rate" (Lipton, at [0011]), "the risk neutral rate" (Lipton, at [0045] and [0065], and claims 1, 6, 11, 12, 22, and 32), and "the interest rate" (Lipton at [0103], [0113], and [0121], and claims 17, 18, 19, 26, 27, and 29). Lipton et al. does not teach use of risk premia, of volatility as a priced risk factor, or of expected loss given default. Embodiments of the Applicant's invention does not use the "risk neutral world' framework, but use a "real world" framework. This point is discussed at the instant specification, for example, at [0004], [0007]-[0008], [0072], [0122], and [0205]. Embodiments of Applicant's invention teach the use of risk premia in pricing or valuing

securities and in applying option theoretic models of the firm. This limitation is expressed in the Applicant's claims, for example in claim 165: "…determining a risk premium, above a risk free rate of return, incorporated in the rate of return for each security…". By way of dependency this limitation is then also present in Applicant's claim 185, which also includes the limitation, "… the parameters including a risk premium in the rate of return for each security issued by, or referenced to, the firm…". By way of dependency this limitation is then also present in Applicant's claim 187 and hence in claims 193-194. Similar limitations occur in, and / or follow the same dependency in claims 219, 239, and 247-248 and also 273, 293, and 301-302. Applicant's claims 193-194, 247-248, and 301-302 are claims that the Office cites to Lipton et al. with regards to.

Regarding the combination of Sandretto in view of Pang in further in view of Sant, Official Action at 60. Sant teaches analysis of the covariance between pairs of stocks as an intermediate step to calculating the variance of a portfolio (Sant, at [0444]). Embodiments of Applicant's invention are not directed to portfolio risk analysis and do not analyse the covariance between pairs of stocks. Embodiments of Applicant's invention use covariance in order to fit models. For this purpose, embodiments of the Applicant's invention analyses the covariance between pairs of securities referenced to the same firm (of which only one type of security can be common stock, as is known in the art) - this limitation is present in Applicant's claims 198, 252, and 306.

Regarding the combination of Sandretto in view of Pang in further in view of Sant, Official Action at 62, Sant teaches analysis of the covariance between pairs of stocks as an intermediate step to calculating the variance of a portfolio (Sant, at [0444]). Embodiments of Applicant's invention are not directed to portfolio risk analysis and do not analyse the covariance between pairs of stocks. Embodiments of Applicant's invention use covariance in order to fit models. For this purpose, embodiments of the Applicant's invention analyses the covariance between a security and the underlying firm to which it is referenced - this limitation is present in Applicant's claims 200, 254, and 308.

Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 63, Lipton et al. teaches default using Zhou's model. This model is

implemented in the Black-Scholes risk neutral framework. Lipton et al. uses a risk free interest rate (r) in its application, where it is variously referred to as "the risk free interest rate" (Lipton, at [0011]), "the risk neutral rate" (Lipton, at [0045] and [0065], and claims 1, 6, 11, 12, 22, and 32), and "the interest rate" (Lipton at [0103], [0113], and [0121], and claims 17, 18, 19, 26, 27, and 29). Lipton et al. does not teach use of risk premia, of volatility as a priced risk factor, or of expected loss given default. Embodiments of the Applicant's invention do not use the "risk neutral world' framework, but use a "real world" framework. This point is discussed at the instant specification, for example, at [0004], [0007]-[0008], [0072], [0122], and [0205]. Embodiments of Applicant's invention teach the use of risk premia in pricing or valuing securities and in applying option theoretic models of the firm. This limitation is expressed in the Applicant's claims, for example, in claim 165: "…determining a risk premium, above a risk free rate of return, incorporated in the rate of return for each security…". By way of dependency this limitation is then also present in Applicant's claim 185, which also includes the limitation "… the parameters including a risk premium in the rate of return for each security issued by, or referenced to, the firm…". By way of dependency this limitation is then also present in Applicant's claim 201. Similar limitations occur in, and / or follow the same dependency in claims 219, 239, and 255 and also 273, 293, and 309. Applicant's claims 201, 255, and 309 are claims that the Office cites to Lipton et al. in regards to.

Accordingly, for the reasons set forth above, Applicant requests that the Office reconsider the rejection of the invention recited in the instant claims.

The Prior Art Teaches Away

Regarding the combination of Sandretto in view of Pang et al., Official Action, at 40, Sandretto teaches use of the CAPM, a model known in the art. The teachings of the CAPM model are that the total risk of an asset, as measured by its volatility, is not relevant for asset pricing. Instead it is only the *systematic* component of risk, as measured by beta, that is relevant for asset pricing. The rationale in the art is that, by holding a diversified portfolio investors can virtually eliminate their exposure to *non-systematic* risk. It is taught that investors should not expect any reward for bearing non-systematic risk. Accordingly, it is submitted that the CAPM

prior art, as cited in Sandretto, teaches away from use of total volatility as a priced risk measure as recited in the claims.

In discussing the CAPM equation, Elton and Gruber, Modern Portfolio Theory and Investment Analysis, 5th edition, 1995, states, at 301:

> One of the greatest insights that comes from this equation arises from what it states is unimportant in determining return. Recall that in Chapter 7 we saw that the risk of any stock could be divided into systematic and unsystematic risk. Beta was the index of systematic risk. This equation validates the conclusion that systematic risk is the only important ingredient in determining expected returns and that non-systematic risk plays no role.

Additionally, in Brealey and Myers, Principles of Corporate Finance, international student edition, 1981, states at 127:

> If we want to know the contribution of an individual security to the risk of a well-diversified portfolio, it is no good thinking about how risky that security is if held in isolation – we need to measure its market risk and that boils down to measuring how sensitive it is to market movements. The sensitivity of an investment's return to market movements is usually called its beta ($\beta$).

Regarding the combination of Sandretto in view of Pang et al., Official Action, at 40, Pang et al. teaches use of the Black-Scholes option pricing framework, which is based on an assumption of "risk neutrality." Regarding the combination of Sandretto in view of Pang in further in view of Hunealt, Official Action at 53, Hunealt applies a topographical mapping method to options, but in doing so merely uses the Black-Scholes risk neutral option valuation framework that is known in the art. Regarding the combination of Sandretto in view of Pang in further in view of Lipton et al., Official Action at 55, Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 60, Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 63. Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework.

The teachings of the Black-Scholes risk neutral framework in the art are that it is unnecessary, and indeed extremely difficult, to include a risk premium in the analysis of options. The Black-Scholes prior art thus teaches away from inclusion of risk premia. The instant specification at [0008] includes the following quote from a press release at the time two of the three academics behind the Black-Scholes framework received Nobel Prizes in economics:

> The value of an option to buy or sell a share depends on the uncertain development of the share price to the date of maturity. It is therefore natural to suppose-as did earlier researchers-that valuation of an option requires taking a stance on which risk premium to use, in the same way as one has to determine which risk premium to use when calculating present values in the evaluation of a future physical investment project with uncertain returns. Assigning a risk premium is difficult, however, in that the correct risk premium depends on the investor's attitude towards risk. Whereas the attitude towards risk can be strictly defined in theory, it is hard or impossible to observe in reality.

In discussing the Black-Scholes option pricing formula, Brealey and Myers states at 440:

> For our purposes the precise formula is less important than the terms that appear in it. Notice that the willingness of individuals to bear risk does not affect value, nor does the expected return on the stock.

Additionally, Elton and Gruber states at 589:

> Perhaps the most interesting aspect of the Black-Scholes model is a variable that does not appear as a determinant of the value of a call. This variable is the expected rate of return on the stock.

Additionally, Chance, An Introduction to Derivatives, 3rd edition, 1995, states at 7:

> While most individuals are indeed risk averse, it may surprise you to find that in the world of derivative markets, we can actually pretend that most people are risk neutral. No, we are not making some heroic but unrealistic assumption. It turns out that we obtain the same results in a world of risk aversion as we do in a world of risk neutrality.

Additionally, Hull, Opions, Future and Other Derivatives, 5th edition, 2002, states at 244-245:

> We introduced risk-neutral valuation in connection with the binomial model in Chapter 10. It is without doubt the single most important tool for the analysis of derivatives. It arises from one key property of the Black-Scholes-Merton differential equation (12.15). This property is that the equation does not involve any variable that is affected by the risk preferences of investors.

Unexpected Results

Regarding the combination of Sandretto in view of Pang et al., Official Action, at 40. Pang et al. teaches use of the Black-Scholes option pricing framework, which is based on an assumption of "risk neutrality." Regarding the combination of Sandretto in view of Pang in further in view of Hunealt, Official Action at 53. Hunealt applies a topographical mapping method to options, but in doing so merely uses the Black-Scholes risk neutral option valuation framework that is known in the art. Regarding the combination of Sandretto in view of Pang in further in view of Lipton et al., Official Action at 55. Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 60. Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework. Regarding the combination of Sandretto in view of Pang in further in view of Lipton, Official Action at 63, Lipton et al. teaches default using Zhou's model. This model is implemented in the Black-Scholes risk neutral framework.

The prior art on the Black-Scholes framework teaches that even if risk premia were included in an option pricing model, the resulting option values, across different strike prices, would still be the same as under the risk-neutral Black-Scholes framework. An unexpected result of embodiments of Applicant's invention is that different option values are obtained for different option strike prices and a single volatility input than from under the risk-neutral Black-Scholes framework. This may be seen, for example, in figure 9 of the instant specification. Embodiments of Applicant's invention is thus able to, at least in part, solve the volatility smile problem known in the art and illustrated in figure 8 of Applicant's specification. This is an unexpected result from including risk premia in an option pricing framework.

In addition, the prior art of analysing an option-theoretic model of the firm in a risk neutral world has found that when using realistic parameters the model predicted credit spreads are too low. Applicant's incorporation of risk premia into an option-theoretic model of the firm is able to produce higher credit spreads that more closely align with those observed in the market. This is an unexpected result from including risk premia in an option-theoretic model of the firm.

Defects with the Office's Rationale for Rejecting the Claims

In respect to the rejection of independent claims 165, 219 and 273 (Official Action, at 40), elements of Applicant's claims are not present in either Sandretto or Pang et al. These elements are that volatility, measured over discrete time, is a priced risk factor and that the price per unit of risk, for each priced risk factor, is the same for two or more securities issued by or referenced to the same underlying asset or firm. Furthermore, even if all of Applicant's features had been present in Sandretto and Pang, there would have been no motivation or suggestion to combine. The prior art teaches away from using volatility as a priced risk measure. The prior art also teaches away from using risk premia in an option pricing model or an option-theoretic model of the firm and from treating total volatility as a priced risk factor. In addition, by introducing risk premia into an option pricing model or an option-theoretic model of the firm Applicant's invention produces unexpected results. In the former case the volatility smile can be explained and in the latter case more realistic credit spreads can be modelled.

In respect to the rejection of independent claims 209, 263 and 317, elements of Applicant's claims are not present in either Sandretto or Pang et al. These elements are the application of an option-theoretic model of the firm and fitting such a model using risk parameters measured over discrete time. Furthermore, even if all of Applicant's features had been present in Sandretto and Pang, there would have been no motivation or suggestion to combine.

The Office then concludes that:

> It would have been obvious to one of ordinary skill in the art at the time of invention to use volatility as taught by Pang et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable.

Official Action, at 43.

To support a combined-reference obviousness rejection, there must be a clearly articulated rationale for combining the prior art in a manner which meets the Applicant's claims. Indeed, as stated in MPEP § 2141, the key to supporting any rejection under Section 103 is "the

clear articulation of the reason(s) why the claimed invention would have been obvious." Moreover, "rejections on obviousness cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." Exemplary rationales that may support a conclusion of obviousness, as set forth in MPEP 2141, include those noted below in the margin.[1] Of these enumerated rationales that may support an obviousness rejection, the only one that could arguably correspond to the Office's combination of Sandretto and Pang are, "(A) Combining prior art elements according to known methods to yield predictable results," and "(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention." In this case, however, the Official Action offers a deficient justification of the rejection. The simple assertion of,

> It would have been obvious to one of ordinary skill in the art at the time of invention to use volatility as taught by Pang et al. since the claimed invention is merely a combination of old elements and in the combination each element merely would have performed the same function as it did separately, and one of ordinary skill in the art would have recognized that the results of the combination were predictable,

(Official Action, at 43) falls short of the required showing set forth in the MPEP, i.e., a "clear articulation of the reason(s) why the claimed invention would have been obvious" and "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." For example, under category (A), the office action is deficient because it lacks the

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[1] (A) Combining prior art elements according to known methods to yield predictable results;
(B) Simple substitution of one known element for another to obtain predictable results;
(C) Use of known technique to improve similar devices (methods, or products) in the same way;
(D) Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results;
(E) "Obvious to try" - choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;
(F) Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art;
(G) Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

necessary substantial (non-conclusory) showing of how Sandretto and Pang, when combined per claims 165, 209, 219, 263, 273, and 317, would yield predictable results, or what methods are known to perform such combining (this is in addition to the fact that key elements of the Applicant's invention are not present in either Sandretto or Pang, as discussed above). Further, under category (G), the Official Action is lacking with respect to the required teaching, suggestion, or motivation that would have led one of ordinary skill to modify Sandretto or to combine Sandretto and Pang to arrive at the claimed invention. Thus, Applicant submits that a *prima facie* case of obviousness has not been established pursuant to MPEP 2141.

For these reasons, Applicant respectfully requests that the Office withdraw the rejections under 35 U.S.C. § 103(a). Applicant therefore respectfully requests reconsideration and withdrawal of the rejections of all claims that depend from the independent claims for at least the reasons stated with regard to their respective independent claim.

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